JOURNAL OF CLINICAL MICROBIOLOGY, Jan. 1976, p. 77-78

Vol. 3, No. 1
Printed in U.S.A.

Isolation and Characterization of a Catalase-Negative Strain of *Staphylococcus aureus*

KEVIN K. TU* AND WALDEMAR A. PALUTKE

Department of Pathology, School of Medicine, Wayne State University, Detroit, Michigan 48201, and Microbiology Laboratory, Detroit General Hospital, Detroit, Michigan 48226*

Received for publication 11 August 1975

An unusual, naturally occurring strain of *Staphylococcus aureus* is characterized. It is typical in colony and cellular morphology, coagulase production, and other biochemical reactions as compared to *S. aureus* (ATCC-25923), except that it is catalase negative and fails to ferment mannitol anaerobically.

In classical description, staphylococci are gram-positive, catalase-positive, glucose-fermentative, and cluster-forming cocci (1, 6). Coagulase production and anaerobic fermentation of mannitol are the minimum characteristics further distinguishing *Staphylococcus aureus* from other staphylococci (1, 6). Due to genetic variation some strains of coagulase-positive staphylococci lack the ability to ferment mannitol but are nevertheless regarded as *S. aureus* (6). Catalase-negative *S. aureus* has been previously isolated from a human source (8) and an animal source (5). In this note we describe a strain of *S. aureus* which is catalase negative and fails to ferment mannitol anaerobically in Baird-Parker subcommittee medium (11).

The purpose of presenting this note is (i) to emphasize the existence of catalase-negative, mannitol nonfermentative *S. aureus*, and (ii) to encourage other clinical laboratories to identify such strains so that their incidence can be more accurately established.

This strain was isolated from five of six blood specimens of a 24-year-old female who was a heroin addict and was clinically septicemic during the time the specimens were taken. All five blood isolates produced typical golden-yellow, opaque, circular, smooth, raised, creamy colonies with beta-hemolysis on 5% sheep blood Trypticase soy agar plates. In gram smears they appeared as gram-positive, cluster-forming cocci. Since they were catalase negative on primary isolation, they were subcultured onto nutrient agar slants and the catalase test was repeated with freshly opened commercially available 3% hydrogen peroxide, USP (Parke-Davis, Detroit, Mich.). All five isolates remained catalase negative even at the seventh subculture. The modified benzidine test (4) was then performed to determine whether this strain contained a cytochrome system. The positive results of all isolates indicate that these bacteria do contain a cytochrome system. Except for catalase negativity and absence of mannitol fermentation, other biochemical reactions of this strain are quite typical of the Seattle strain of *S. aureus* (ATCC-25923) (Table 1).

Since this strain was isolated from a patient

TABLE 1. *Characteristics of catalase-negative isolates (current case) compared to Staphylococcus aureus (ATCC-25923)*

Test	Catalase-negative isolates	*S. aureus* (ATCC-25923)
Coagulase	+	+
Anaerobic growth and fermentation of glucose (11)	+	+
Catalase	−	+
Benzidine test (4)	+	+
Mannitol (11):		
Acid aerobically	+	+
Acid anaerobically	−	+
Acid (aerobically and anaerobically (11):		
Maltose	+	+
Sucrose	+	+
Trehalose	+	+
Lactose	+	+
Xylose	−	−
Dulcitol	−	−
Salicin	−	−
Nitrate reduction	+	+
Urease production	+	+
Thermostable nuclease production (17)	+	+
Sensitivity to:	−	−
Lysozyme (25 μg/ml) (9)	−	−
Lysozyme (400 μg/ml) (10)	−	−
Lysostaphin (200 μg/ml) (10)	+	+

who had been treated with penicillin before her admission, antibiotic susceptibility tests (2) were performed on all five isolates. The results indicate that this strain of *S. aureus* is sensitive to cephalothin, chloramphenicol, clindamycin, erythromycin, novobiocin, oxacillin, tetracycline, and vancomycin, but is resistant to ampicillin, penicillin G, and colistin. This antibiogram clearly shows that this is a penicillinase-producing strain of *S. aureus* and explains the lack of response to penicillin therapy.

Bacteriophage typing (by the Michigan Department of Public Health) indicates that the strain belongs to phage type 94. Resistance to ampicillin, colistin, and penicillin in the antibiotic susceptibility test further provides confirmation that this strain belongs to *Staphylococcus* phage type 94 (3).

Although catalase-negative *S. aureus* has already been reported in the United States (8) and Great Britain (5), our strain differs from those in that it does not ferment mannitol anaerobically and was found in multiple blood samples from a septicemic patient. The previously reported strains were not characterized with respect to cytochrome system status or phage type.

We are grateful to Richard R. Facklam of the National Center for Disease Control for his suggestions and critical review of this note, to Yvonne Maddock for referring the strain to us, and to Charles D. Jeffries of the Department of Immunology and Microbiology, School of Medicine, Wayne State University, for supplying the reagents for the thermostable nuclease test.

This study was supported in part by the Detroit General Hospital Research Corp.

LITERATURE CITED

1. Baird-Parker, A. C. 1974. Gram-positive cocci, p. 478–490. *In* R. E. Buchanan and N. E. Gibbons (ed.), Bergey's manual of determinative bacteriology, 8th ed. The Williams & Wilkins Co., Baltimore.
2. Bauer, A. W., W. M. M. Kirby, J. C. Sherris, and M. Turck. 1966. Antibiotic susceptibility testing by a standardized single disc method. Am. J. Clin. Pathol. 45:493–497.
3. Blouse, L. E., W. B. Stringfield, R. V. Marraro, and H. J. Dupuy. 1973. Activity and characteristics of a new staphylococcus phage 94. Proc. Soc. Exp. Biol. Med. 142:572–576.
4. Deibel, R. H., and J. B. Evans. 1960. Modified benzidine test for the detection of cytochrome containing respiratory systems in microorganisms. J. Bacteriol. 79:356–360.
5. Everall, P. H., and P. M. Stacey. 1956. Catalase negative *Staphylococcus aureus*. J. Med. Lab. Technol. 13:489–490.
6. Ivler, D. 1974. *Staphylococcus*, p. 91–95. *In* E. H. Lennette, E. H. Spaulding, and J. P. Truant (ed.), Manual of clinical microbiology, 2nd ed. American Society for Microbiology, Washington, D. C.
7. Lachica R. V. F., C. Genigeorgis, and P. D. Hoeprich. 1971. Metachromatic agar-diffusion methods for detecting staphylococcal nuclease activity. Appl. Microbiol. 21:585–587.
8. Lucas, P. R., and H. W. Seeley. 1955. A catalase negative *Micrococcus pyogenes* var. *aureus*. J. Bacteriol. 69:231.
9. Schleifer, K. H., and W. E. Kloos. 1975. A simple test system for the separation of staphylococci from micrococci. J. Clin. Microbiol. 1:337–338.
10. Schleifer, K. H., and W. E. Kloos. 1975. Isolation and characterization of staphylococci from human skin. I. Amended descriptions of *Staphylococcus epidermidis* and *Staphylococcus saprophyticus* and descriptions of three new species: *Staphylococcus cohnii*, *Staphylococcus haemolyticus*, and *Staphylococcus xylosus*. Int. J. Syst. Bacteriol. 25:50–61.
11. Subcommittee on taxonomy of staphylococci and micrococci. 1965. Recommendations. Int. Bull. Bacteriol. Nomencl. Taxon. 15:109–110.